

Appl. No. 09/818,193
Amdt. Dated August 23, 2004
Reply to Office Action of June 14, 2004

Amendments to the Claims

This listing of claims will replace all prior version and listings of claims in the application:

Listing of Claims:

1. (Currently amended): A method for manufacturing a semiconductor device comprising the steps of:
forming a layer of silicon dioxide on a silicon carbide substrate to create a silicon carbide/silicon carbide interface with an interface trap density; and
incorporating nitrogen at the silicon dioxide/silicon carbide-interface for reduction in the interface trap density,
wherein the silicon carbide substrate comprises 4H-SiC and is doped with an n-type dopant.
- 2-4. (Canceled).
5. (Currently amended): The method of Claim 1, wherein the step of forming the layer of silicon dioxide is formed by a method comprising comprises the steps of:
cleaning the silicon carbide substrate; and
oxidizing the silicon carbide substrate.
6. (Currently amended): The method of Claim 5, wherein the step of cleaning the silicon carbide substrate is cleaned is performed with a solution having 10% HF in weight.
7. (Currently amended): The method of Claim 5, wherein the step of oxidizing the silicon carbide substrate is performed thermally oxidized.

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8. (Original): The method of Claim 7, wherein the silicon carbide substrate is oxidized at between about 900 °C and about 1150 °C.
9. (Original): The method of Claim 1, wherein the layer of silicon dioxide is greater than about 10 Å thick.
10. (Currently amended): The method of Claim 1, wherein the nitrogen ~~nitrogen~~ is incorporated by annealing the semiconductor device in nitric oxide or nitrous oxide.
11. (Original): The method of Claim 10, wherein the semiconductor device is annealed at between about 950 °C and about 1200 °C for between about 1 and about 4 hours.
12. (Original): The method of Claim 11, wherein the semiconductor device is annealed at about 1175 °C.
13. (Currently amended): The method of Claim 1, wherein the nitrogen ~~nitrogen~~ is incorporated by annealing the semiconductor device is ammonia.
14. (Original): The method of Claim 13, wherein the semiconductor device is annealed at about between 950 °C and about 1200 °C for about 4 hours.
15. (Original): The method of Claim 14, wherein the semiconductor device is annealed at about between 1175 °C.
16. (Currently amended): The method of Claim 1, wherein an areal ~~the areal~~ density of nitrogen at the silicon dioxide/silicon carbide interface is between about $0.5 \times 10^{14} \text{ cm}^{-2}$ and about $1 \times 10^{16} \text{ cm}^{-2}$.

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17. (Original): The method of Claim 16, wherein the areal density of nitrogen at the silicon dioxide/silicon carbide interface is between about $1 \times 10^{14} \text{ cm}^{-2}$ and about $2 \times 10^{15} \text{ cm}^{-2}$.
18. (Original): The method of Claim 1, wherein the maximum concentration of nitrogen at the silicon dioxide/silicon carbide interface is about 0.5%.
19. (Currently amended): A semiconductor device comprising:
a silicon carbide substrate;
a layer of silicon dioxide disposed on the silicon carbide substrate to create a silicon dioxide/silicon carbide interface with an interface trap density; and
a region of substantial nitrogen concentration at the silicon dioxide/silicon carbide interface for reduction in the interface trap density,
wherein the silicon carbide substrate comprises 4H-SiC and is doped with an n-type dopant.
- 20-22. (Canceled).
- ~~2322.~~ (Currently amended): The semiconductor device of Claim 19~~Claim 1~~, wherein an areal density~~the areal density~~ of nitrogen at the silicon dioxide/silicon carbide interface is between about $0.5 \times 10^{14} \text{ cm}^{-2}$ and about $1 \times 10^{16} \text{ cm}^{-2}$.
- ~~2423.~~ (Currently amended): The semiconductor device of Claim 23~~Claim 22~~, wherein the areal density of nitrogen at the silicon dioxide/silicon carbide interface is between about $1 \times 10^{14} \text{ cm}^{-2}$ and about $2 \times 10^{15} \text{ cm}^{-2}$.

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2524. (Currently amended): The semiconductor device of Claim 19~~Claim 1~~, wherein the maximum concentration of nitrogen at the silicon dioxide/silicon carbide interface is about 0.5%.

2625. (Currently amended): The semiconductor device of Claim 19~~Claim 1~~, wherein the layer of silicon dioxide is greater than about 10 Å thick.